

Claims

- [c1] 1. A method of forming an overlay mark, comprising:
- forming a first material layer on a substrate;
 - forming a first trench serving as a first portion of a trench type outer mark in the first material layer;
 - forming a first deposition layer on the first material layer, wherein the first trench is partially or incompletely filled with the first deposition layer;
 - performing a first chemical mechanical polishing process on the first deposition layer until the first material layer is exposed leaving a remaining portion of the first deposition layer in the first trench;
 - forming a second material layer to cover the first material layer and the first deposition layer, wherein a thickness of the second material layer is smaller than that of the first material layer;
 - removing the second material layer on the trench type outer mark to form a second trench exposing at least a portion of the first deposition layer in the first trench, wherein the second trench serves as a second portion of the trench type outer mark;
 - forming a second deposition layer on the substrate to cover the second material layer and the first deposition

layer in the first trench;
performing a second chemical mechanical polishing process on the second deposition layer until the second material layer in the second trench is exposed;
forming a third deposition layer on the second material layer, wherein a step height is formed on the third deposition layer between the edge of the first trench and the center of the first trench; and
forming a raised feature serving as an inner mark on the third deposition layer.

- [c2] 2. The method of claim 1, wherein a width of the second trench is larger than that of the first trench, and the second trench exposes the first deposition layer in the first trench and a portion of the first material layer.
- [c3] 3. The method of claim 2, wherein a difference in distance between a side wall of the second trench and that of the first trench is no less than 150 nm.
- [c4] 4. The method of claim 1, wherein a width of the second trench is smaller than that of the first trench and the second trench exposes a portion of the first deposition layer in the first trench.
- [c5] 5. The method of claim 1, wherein the raised feature comprises a patterned photoresist layer.

[c6] 6. The method of claim 1, wherein the first material layer and the second material layer comprise a dielectric layer respectively, and the first deposition layer, the second deposition layer and the third deposition layer comprise a metal layer respectively.

[c7] 7. A method of forming an overlay mark, comprising:
forming a first material layer on a substrate;
patterning the first material layer to form a first raised feature serving as a portion of a raised type outer mark on the substrate;
forming a first deposition layer to cover the substrate and the first raised feature, wherein a thickness of the first deposition layer is thinner than that of the first material layer;
performing a first chemical mechanical polishing process on the first deposition layer until a top surface of the first raised feature is exposed;
forming a second material layer to cover the first deposition layer and the first raised feature, wherein a thickness of the second material layer is smaller than that of the first material layer;
patterning the second material layer to form a second raised feature on the first raised feature serving as the other portion of the raised type outer mark on the substrate;

forming a second deposition layer to cover the second raised feature and the first deposition layer;
performing a second chemical mechanical polishing process on the second deposition layer until a top surface of the second raised feature is exposed;
forming a third deposition layer on the second material layer, wherein a step height is formed on the third deposition layer between the edge of the second raised feature and the center of the second raised feature; and
forming a third raised feature serving as an inner mark layer on the third deposition layer.

[c8] 8. The method of claim 7, wherein a width of the second raised feature is smaller than that of the first raised feature, so that the second raised feature exposes a portion of the first raised feature.

[c9] 9. The method of claim 8, wherein a difference in distance between a side wall of the first raised feature and that of the second raised feature is no less than 150 nm.

[c10] 10. The method of claim 7, wherein a width of the second raised feature is larger than that of the first raised feature, so that the second raised feature covers the first raised feature and a portion of the first deposition layer.

[c11] 11. The method of claim 7, wherein the third raised fea-

ture comprises a patterned photoresist layer.

- [c12] 12. The method of claim 7, wherein the first material layer and the second material layer comprise a dielectric layer respectively, and the first deposition layer, the second deposition layer and the third deposition layer comprise a metal layer respectively.
- [c13] 13. A overlay mark, comprising:
a first material layer having a first trench therein serving as a first portion of a trench type outer mark;
a first deposition layer partially or incompletely filling the first trench;
a second material layer having a second trench therein serving as a second portion of the trench type outer mark, wherein a thickness of the second material layer is smaller than that of the first material layer and the second trench exposes at least a portion of the first deposition layer in the first trench;
a second deposition layer partially or incompletely filling the second trench and covering the first deposition layer in the first trench;
a third deposition layer covering the second material and the second deposition layer, wherein a step height is formed on third deposition layer between the edge of the first trench and the center of the first trench, because the first trench incompletely fills with the first deposition

layer, respectively; and

a raised feature made of a patterned photoresist layer on the third deposition layer to serving as an inner mark.

[c14] 14. The overlay mark of claim 13, wherein a width of the second trench is larger than that of the first trench, and the second trench exposes the first deposition layer in the first trench and a portion of the first material layer.

[c15] 15. The overlay mark of claim 14, wherein a difference in distance between a side wall of the second trench and that of the first trench is no less than 150 nm.

[c16] 16. The overlay mark of claim 13, wherein a width of the second trench is smaller than that of the first trench and the second trench exposes a portion of the first deposition layer in the first trench.

[c17] 17. The overlay mark of claim 13, wherein the first material layer and the second material layer comprise a dielectric layer respectively, and the first deposition layer, the second material layer and the third material layer comprise a metal layer respectively.

[c18] 18. An overlay mark, comprising:
a first raised feature serving as a first portion of a raised type outer mark on a substrate;
a first deposition layer covering a side wall of the first

raised feature and the substrate;
a second raised feature serving as a second portion of the raised type outer mark covering the first raised feature, wherein a thickness of the second raised feature is smaller than that of the first raised feature;
a second deposition layer covering a side wall of the second feature and the first deposition layer;
a third deposition layer covering the second raised feature and the second deposition layer, wherein a step height is formed on the third deposition layer between the edge of the second raised feature and the center of the second raised feature; and
a third raised feature made of a patterned photoresist layer on the third deposition layer serving as an inner mark.

[c19] 19. The overlay mark of claim 18, wherein a width of the second raised feature is smaller than that of the first raised feature, so that the second raised feature exposes a portion of the first raised feature.

[c20] 20. The overlay mark of claim 19, wherein a difference in distance between a side wall of the first raised feature and that of the second raised feature is no less than 150 nm.

[c21] 21. The overlay mark of claim 18, wherein a width of the

second raised feature is larger than that of the first raised feature, and so that the second raised feature covers the first raised feature and a portion of the first deposition layer.

[c22] 22. The overlay mark of claim 18, wherein the top surface of the first deposition layer on the substrate is lower than the top surface of the first raised feature.

[c23] 23. The overlay mark of claim 18, wherein the first raised feature and the second raised feature comprise a dielectric layer respectively, and the first deposition layer, the second material layer and the third material layer comprise a metal layer respectively.